

## **Claims**

Claim 1 (previously presented) A process for producing  $\text{CF}_3\text{CFHCF}_3$  comprising:

contacting a C-3 reactant comprising one or more of perhydrogenated or partially halogenated C-3 hydrocarbons with  $\text{Cl}_2$  and HF in the presence of a first catalyst at a first temperature to form a C-3 product comprising a C-3 perhalogenated compound;

contacting the C-3 product with HF in the presence of a second catalyst at a second temperature to form a  $\text{CF}_3\text{CCl}_2\text{CF}_3$  product, the  $\text{CF}_3\text{CCl}_2\text{CF}_3$  product comprising a mole ratio of  $\text{CF}_3\text{CCl}_2\text{CF}_3$  to  $\text{CF}_3\text{CFCICClF}_2$  greater than 2:1;

contacting the  $\text{CF}_3\text{CCl}_2\text{CF}_3$  product with HF in the presence of a third catalyst at a third temperature to form  $\text{CF}_3\text{CClFCF}_3$ ; and

contacting the  $\text{CF}_3\text{CClFCF}_3$  with  $\text{H}_2$  in the presence of a fourth catalyst at a fourth temperature to produce  $\text{CF}_3\text{CFHCF}_3$ .

Claim 2 (original): The process of claim 1 wherein the first temperature is at least about 150°C, the second temperature is at least about 300°C, the third temperature is at least about 200°C and the fourth temperature is at least about 30°C.

Claim 3 (original): The process of claim 2 wherein the first temperature is from about 150°C to about 450°C, the second temperature is from about 300°C to about 550°C, the third temperature is from about 200°C to about 550°C and the fourth temperature is from about 30°C to about 275°C.

Claim 4 (previously presented): The process of claim 3 wherein the first temperature is at least about 220°C, the second temperature is at least about 470°C, the third temperature is at least about 470°C and the fourth temperature is at least about 185°C.

Claim 5 (previously presented): The process of claim 1 wherein, during the contacting of the C-3 reactant with the HF and the Cl<sub>2</sub>, a molar ratio of the HF to the Cl<sub>2</sub> is from about 0.75:1 to about 8:1.

Claim 6 (previously presented): The process of claim 5 wherein, during the contacting of the C-3 reactant with the HF and the Cl<sub>2</sub>, a molar ratio of the HF to the Cl<sub>2</sub> is at least about 4:1.

Claim 7 (previously presented): The process of claim 1 wherein, during the contacting of the C-3 reactant with the HF and the Cl<sub>2</sub>, a molar ratio of the Cl<sub>2</sub> to the C-3 reactant is from about 8:1 to about 10:1.

Claim 8 (previously presented): The process of claim 7 wherein, during the contacting of the C-3 reactant with the HF and the Cl<sub>2</sub>, a molar ratio of the Cl<sub>2</sub> to the C-3 reactant is at least about 8.2:1.

Claim 9 (previously presented): The process of claim 1 wherein, during the contacting of the C-3 reactant with the HF and the Cl<sub>2</sub>, a molar ratio of the HF to the C-3 reactant is from about 6:1 to about 64:1.

Claim 10 (previously presented): The process of claim 9 wherein, during the contacting of the C-3 reactant with the HF and the Cl<sub>2</sub>, a molar ratio of the HF to the C-3 reactant is at least about 35:1.

Claim 11 (previously presented): The process of claim 1 wherein, during the contacting of the C-3 product with the HF, a molar ratio of the HF to the C-3 product is from about 6:1 to about 64:1.

Claim 12 (previously presented): The process of claim 11 wherein, during the contacting of the C-3 product with the HF, a molar ratio of the HF to the C-3 product is at least about 30:1.

Claim 13 (previously presented): The process of claim 1 wherein, during the contacting of the CF<sub>3</sub>CCl<sub>2</sub>CF<sub>3</sub> product with the HF, a molar ratio of the HF to the CF<sub>3</sub>CCl<sub>2</sub>CF<sub>3</sub> is from about 1:1 to about 30:1.

Claim 14 (previously presented): The process of claim 13 wherein, during the contacting of the CF<sub>3</sub>CCl<sub>2</sub>CF<sub>3</sub> product with the HF, a molar ratio of the HF to the CF<sub>3</sub>CCl<sub>2</sub>CF<sub>3</sub> is at least about 10:1.

Claim 15 (previously presented): The process of claim 1 wherein, during the contacting of the CF<sub>3</sub>CClFCF<sub>3</sub> with the H<sub>2</sub>, a molar ratio of the H<sub>2</sub> to the CF<sub>3</sub>CClFCF<sub>3</sub> is from about 0.2:1 to about 10:1.

Claim 16 (previously presented): The process of claim 15 wherein, during the contacting of the  $\text{CF}_3\text{CCIFCF}_3$  with the  $\text{H}_2$ , a molar ratio of the  $\text{H}_2$  to the  $\text{CF}_3\text{CCIFCF}_3$  is at least about 1.2:1.

Claim 17 (previously presented): The process of claim 1 further comprising, during the contacting of the  $\text{CF}_3\text{CCIFCF}_3$  with  $\text{H}_2$ , contacting the fourth catalyst with water.

Claim 18 (previously presented): The process of claim 17 wherein the water is present in an amount from about 0.04 to about 12 percent by weight of the  $\text{CF}_3\text{CCIFCF}_3$ .

Claim 19 (previously presented): The process of claim 18 wherein the amount is about 0.8 percent by weight of the  $\text{CF}_3\text{CCIFCF}_3$ .

Claim 20 (previously presented): The process of claim 1 further comprising, during the contacting of the C-3 product with HF, contacting the C-3 product with  $\text{Cl}_2$ .

Claim 21 (previously presented): The process of claim 1 wherein the first catalyst comprises chromium and a catalyst support.

Claim 22 (previously presented): The process of claim 1 wherein the second catalyst comprises chromium and a catalyst support.

Claim 23 (previously presented): The process of claim 1 wherein the third catalyst comprises chromium and a catalyst support.

Claim 24 (previously presented): The process of claim 1 wherein the fourth catalyst comprises palladium and a catalyst support.

Claim 25 (previously presented): The process of claim 1 further comprising, during the contacting of the C-3 reactant with HF and Cl<sub>2</sub>, contacting the C-3 reactant with a diluent.

Claim 26 (previously presented): The process of claim 1 wherein, the C-3 product further comprises a halogenation by-product and, during the contacting of the C-3 reactants with the Cl<sub>2</sub> and the HF, the C-3 reactants further comprises the halogenation by-product.

Claim 27 (previously presented): A process for producing CF<sub>3</sub>CFHCF<sub>3</sub> comprising:

contacting a C-3 reactant comprising one or more of perhydrogenated and partially halogenated C-3 hydrocarbons with Cl<sub>2</sub> and HF in the presence of a first catalyst at a first temperature to form a C-3 product comprising a mole ratio of CF<sub>3</sub>CCl<sub>2</sub>CF<sub>3</sub> to CF<sub>3</sub>CFCICClF<sub>2</sub> greater than 2:1; and

contacting the C-3 product with HF in the presence of a second catalyst at a second temperature to form CF<sub>3</sub>CCIFCF<sub>3</sub>;

contacting the CF<sub>3</sub>CCIFCF<sub>3</sub> with H<sub>2</sub> in the presence of a third catalyst at a third temperature to form CF<sub>3</sub>CFHCF<sub>3</sub>.

Claim 28 (original): The process of claim 39 wherein the first temperature is at least about 150°C, the second temperature is at least about 200°C, and the third temperature is at least about 30°C.

Claim 29 (original): The process of claim 40 wherein the first temperature is from about 150°C to about 300°C, the second temperature is from about 200°C to about 550°C, and the third temperature is from about 30°C to about 275°C.

Claim 30 (previously presented): The process of claim 41 wherein the first temperature is at least about 220°C, the second temperature is at least about 470°C, and the third temperature is at least about 185°C.

Claim 31 (previously presented): The process of claim 39 wherein, during the contacting of the C-3 reactant with the Cl<sub>2</sub> and the HF, a molar ratio of the HF to the Cl<sub>2</sub> is from about 0.75:1 to about 8:1.

Claim 32 (previously presented): The process of claim 43 wherein, during the contacting of the C-3 reactant with the Cl<sub>2</sub> and the HF, a molar ratio of the HF to the Cl<sub>2</sub> is at least about 4:1.

Claim 33 (previously presented): The process of claim 39 wherein, during the contacting of the C-3 reactant with the Cl<sub>2</sub> and the HF, a molar ratio of the Cl<sub>2</sub> to the C-3 reactant is from about 8:1 to about 10:1.

Claim 34 (previously presented): The process of claim 45 wherein, during the contacting of the C-3 reactant with the Cl<sub>2</sub> and the HF, a molar ratio of the Cl<sub>2</sub> to the C-3 reactant is at least about 8.2:1.

Claim 35 (previously presented): The process of claim 39 wherein, during the contacting of the C-3 reactant with the Cl<sub>2</sub> and the HF, a molar ratio of the HF to the C-3 reactant is from about 6:1 to about 64:1.

Claim 36 (previously presented): The process of claim 47 wherein, during the contacting of the C-3 reactant with the Cl<sub>2</sub> and the HF, a molar ratio of the HF to the C-3 reactant is at least about 35:1.

Claim 37 (previously presented): The process of claim 39 wherein, during the contacting of the C-3 product with the HF, a molar ratio of the HF to the C-3 product is from about 6:1 to about 64:1.

Claim 38 (previously presented): The process of claim 49 wherein the, during the contacting of the C-3 product with the HF, a molar ratio of the HF to the C-3 product is at least about 30:1.

Claim 39 (previously presented): The process of claim 39 wherein, during the contacting of the CF<sub>3</sub>CCIFCF<sub>3</sub> with the H<sub>2</sub>, a molar ratio of the H<sub>2</sub> to the CF<sub>3</sub>CCIFCF<sub>3</sub> is from about 0.2:1 to about 10:1.

Claim 40 (previously presented): The process of claim 51 wherein, during the contacting of the CF<sub>3</sub>CCIFCF<sub>3</sub> with the H<sub>2</sub>, a molar ratio of the H<sub>2</sub> to the CF<sub>3</sub>CCIFCF<sub>3</sub> is at least about 1.2:1.

Claim 41 (previously presented): The process of claim 39 further comprising, during the contacting of the CF<sub>3</sub>CCIFCF<sub>3</sub> with the H<sub>2</sub>, contacting the third catalyst with water.

Claim 42 (previously presented): The process of claim 53 wherein the water is present in an amount from about 0.04 to about 12 percent by weight of the  $\text{CF}_3\text{CCIFCF}_3$ .

Claim 43 (previously presented): The process of claim 54 wherein the amount is about 0.8 percent by weight of the  $\text{CF}_3\text{CCIFCF}_3$ .

Claim 44 (previously presented): The process of claim 39 further comprising, during the contacting of the C-3 product with HF, contacting the C-3 product with  $\text{Cl}_2$ .

Claim 45 (previously presented): The process of claim 39 wherein the first catalyst comprises chromium and a catalyst support.

Claim 46 (previously presented): The process of claim 39 wherein the second catalyst comprises chromium and a catalyst support.

Claim 47 (previously presented): The process of claim 39 wherein the third catalyst comprises palladium and a catalyst support.

Claim 48 (previously presented): The process of claim 39 further comprising, during the contacting of the C-3 reactant with  $\text{Cl}_2$  and HF, contacting the C-3 reactant with a diluent.

Claim 49 (previously presented): The process of claim 39 wherein, the C-3 product further comprises a halogenation by-product and, during the contacting of the C-3 reactant with the  $\text{Cl}_2$  and the HF, the C-3 reactant further comprises the halogenation by-product.

Claim 50 (previously presented): The process of claim 1 further comprising, during the contacting of the C-3 product with the HF, contacting the C-3 product with a diluent.

Claim 51 (previously presented): The process of claim 1 further comprising, during the contacting of the  $\text{CF}_3\text{CCl}_2\text{CF}_3$  product with the HF, contacting the  $\text{CF}_3\text{CCl}_2\text{CF}_3$  with a diluent.

Claim 52 (previously presented): The process of claim 1 further comprising, during the contacting of the  $\text{CF}_3\text{CClFCF}_3$  with the  $\text{H}_2$ , contacting the  $\text{CF}_3\text{CClFCF}_3$  with a diluent.

Claim 53 (previously presented): The process of claim 1 wherein the contacting of the  $\text{CF}_3\text{CCl}_2\text{CF}_3$  product with the HF also forms a halogenation exchange by-product and, during the contacting of the C-3 product with HF, the C-3 product further comprises the halogenation exchange by-product.

Claim 54 (previously presented): The process of claim 92 wherein the halogenation exchange by-product comprises one or more of  $\text{CF}_3\text{CCl}_2\text{CF}_3$ ,  $\text{CF}_3\text{CF}_2\text{CF}_3$ , and  $\text{C}_3\text{F}_5\text{Cl}_3$ .

Claim 55 (previously presented): The process of claim 1 wherein the contacting of the  $\text{CF}_3\text{CCl}_2\text{CF}_3$  product with the HF also forms a halogenation exchange by-product and, during the contacting of the C-3 reactant with  $\text{Cl}_2$  and HF, the C-3 reactant further comprises the halogenation exchange by-product.

Claim 56 (previously presented): The process of claim 94 wherein the halogenation exchange by-product comprises one or more of  $\text{CF}_3\text{CCl}_2\text{CF}_3$ ,  $\text{CF}_3\text{CF}_2\text{CF}_3$ , and  $\text{C}_3\text{F}_5\text{Cl}_3$ .

Claim 57 (previously presented): The process of claim 1 wherein the first and the second catalysts comprise the same material.

Claim 58 (previously presented): The process of claim 1 wherein the first and the second catalyst comprise the same material as the third catalyst.

Claim 59 (previously presented): The process of claim 39 further comprising, during the contacting of the C-3 product with the HF, contacting the C-3 product with a diluent.

Claim 60 (previously presented): The process of claim 39 further comprising, during the contacting of the  $\text{CF}_3\text{CCIFCF}_3$  with the  $\text{H}_2$ , contacting the  $\text{CF}_3\text{CCIFCF}_3$  with a diluent.

Claim 61 (previously presented): The process of claim 39 wherein the contacting of the C-3 product with the HF also forms a halogenation exchange by-product and, during the contacting of the C-3 reactant with  $\text{Cl}_2$  and HF, the C-3 reactant further comprises the halogenation exchange by-product.

Claim 62 (previously presented): The process of claim 100 wherein the halogenation exchange by-product comprises one or more of  $\text{CF}_3\text{CCl}_2\text{CF}_3$ ,  $\text{CF}_3\text{CF}_2\text{CF}_3$ , and  $\text{C}_3\text{F}_5\text{Cl}_3$ .

Claim 63 (previously presented): The process of claim 39 wherein the first and the second catalysts comprise the same material.

Claim 64 (previously presented): The process of claim 39 wherein the first and the second catalyst comprise the same material as the third catalyst.